10-27-00 17

Please type a plus sign (+) inside this box → [+]

PTO/SB/05 (4/98)
Approved for use through 09/30/2000 OMB 0651-0032
Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	99B140
First Inventor or Application Identifier	Antulio TARZONA
Title	Improvements In Valves
Express Mail Label No.	EF 132182188US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)* *(Submit an original and a duplicate for fee processing)*
2. [X] Specification [Total Pages 9] *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 U.S.C. 113)* [Total Sheets 1]
4. Oath or Declaration [Total Pages]
   - a. [ ] Newly executed (original or copy)
   - b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d)) *(for continuation/divisional with Box 16 completed)*
     - i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

** NOTE FOR ITEMS 1 & 13 IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).*

5. [ ] Microfiche Computer Program *(Appendix)*
6. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   - a. [ ] Computer Readable Copy
   - b. [ ] Paper Copy (identical to computer copy)
   - c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

7. [ ] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
11. [ ] Preliminary Amendment
12. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
13. [ ] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application Status still proper and desired
14. [X] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
15. [ ] Other: .....

16. **If a CONTINUING APPLICATION,** *check appropriate box, and supply the requisite information below and in a preliminary amendment:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: _____/_____

Prior application information: Examiner _____ *Group / Art Unit:* _____

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

[X] *Customer Number or Bar Code Label* 20411 *(Insert Customer No. or Attach bar code label here)* or [ ] *Correspondence address below*

Name					
Address					
City		State		Zip Code	
Country		Telephone		Fax	

Name (Print/Type)	Philip H. Von Neida	Registration No. (Attorney/Agent)	34,942
Signature		Date	October 24, 2000

Burden Hour Statement. This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Box Patent Application, Washington, DC 20231

PTO/SB/17 (12/98)
Approved for use through 9/30/2000. OMB 0651-0032
Patent and Trademark Office: U.S DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

FEE TRANSMITTAL for FY 2000

Patent fees are subject to annual revision.
Small Entity payments must be supported by a small entity statement, otherwise large entity fees must be paid See Forms PTO/SB/09-12

TOTAL AMOUNT OF PAYMENT ($) 710.00

Complete if Known	
Application Number	
Filing Date	
First Named Inventor	Antulio TARAZONA
Examiner Name	N/A
Group / Art Unit	N/A
Attorney Docket No.	99B140

METHOD OF PAYMENT (check one)

1. [X] The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number: 02-2865
Deposit Account Name: The BOC Group, Inc.

[X] Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17

2. [ ] Payment Enclosed: [ ] Check [ ] Money Order [ ] Other

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
101	760	201	380	Utility filing fee	710.00
106	310	206	155	Design filing fee	
107	480	207	240	Plant filing fee	
108	760	208	380	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) ($) 710.00

2. EXTRA CLAIM FEES

		Extra Claims		Fee from below	Fee Paid
Total Claims	11	-20** = 0	X		=
Independent Claims	1	-3** = 0	X		=
Multiple Dependent					= 0.00

**or number previously paid, if greater; For Reissues, see below

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
103	18	203	9	Claims in excess of 20
102	78	202	39	Independent claims in excess of 3
104	260	204	130	Multiple dependent claim, if not paid
109	78	209	39	** Reissue independent claims over original patent
110	18	210	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
105	130	205	65	Surcharge - late filing fee or oath	0.00
127	50	227	25	Surcharge - late provisional filing fee or cover sheet.	0.00
139	130	139	130	Non-English specification	0.00
147	2,520	147	2,520	For filing a request for reexamination	0.00
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	0.00
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	0.00
115	110	215	55	Extension for reply within first month	0.00
116	380	216	190	Extension for reply within second month	0.00
117	870	217	435	Extension for reply within third month	0.00
118	1,360	218	680	Extension for reply within fourth month	0.00
128	1,850	228	925	Extension for reply within fifth month	0.00
119	300	219	150	Notice of Appeal	0.00
120	300	220	150	Filing a brief in support of an appeal	0.00
121	260	221	130	Request for oral hearing	0.00
138	1,510	138	1,510	Petition to institute a public use proceeding	0.00
140	110	240	55	Petition to revive - unavoidable	0.00
141	1,210	241	605	Petition to revive - unintentional	0.00
142	1,210	242	605	Utility issue fee (or reissue)	0.00
143	430	243	215	Design issue fee	0.00
144	580	244	290	Plant issue fee	0.00
122	130	122	130	Petitions to the Commissioner	0.00
123	50	123	50	Petitions related to provisional applications	0.00
126	240	126	240	Submission of Information Disclosure Stmt	0.00
581	40	581	40	Recording each patent assignment per property (times number of properties)	0.00
146	760	246	380	Filing a submission after final rejection (37 CFR 1.129(a))	0.00
149	760	249	380	For each additional invention to be examined (37 CFR 1.129(b))	0.00
Other fee (specify)					0.00
Other fee (specify)					0.00

*Reduced by Basic Filing Fee Paid SUBTOTAL (3) ($) 0.00

SUBMITTED BY

				Complete (if applicable)	
Typed or Printed Name	Philip H. Von Neida			Reg. Number	34,942
Signature		Date	10/24/00	Deposit Account User ID	02-2865

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Assistant Commissioner for Patents, Washington, DC 20231.

PATENT
ATTORNEY DOCKET NO. 99B140

EXPRESS MAIL LABEL NO. EF 132182188US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

NEW PATENT APPLICATION

IMPROVEMENTS IN VALVES

Inventor (s): TARAZONA, Antulio

SMITH, John Cambridge

CURRINGTON, Ian

Express Mail Label No. EF 132182188US

IMPROVEMENTS IN VALVES

FIELD OF THE INVENTION

The present invention relates to valves and in particular to pressure relief valves.

BACKGROUND OF THE INVENTION

It is known, for example, to locate a pressure relief valve between high and low pressure regions in a pneumatic or vacuum system such valves are actuated at a predetermined differential pressure to relieve the high pressure either to the low pressure region or to atmosphere. This known type of pressure relief valve uses either a spring or sometimes gravity alone to bias a valve stem towards a co-operating valve seat to maintain the valve in a normally closed position.

When this type of valve is required to operate free of oscillations it is common practice to incorporate a damping mechanism. The damping mechanism requires components which are manufactured to close tolerances and in environments where condensation and/or solid deposition may be formed within the valve this presents a risk of malfunction particularly with a spring-biased mechanism.

Express Mail Label No. EF 132182188US

SUMMARY OF THE INVENTION

It is an aim of the present invention to provide a valve which incorporates a magnetic means for biasing the valve towards its closed position and which operates substantially free of oscillations while maintaining large internal clearances. This permits the valve to operate in environments where condensation and/or solid deposition may occur.

According to the present invention, a valve comprises a housing having an inlet and spaced therefrom an outlet, a passageway extending between the inlet and the outlet and means located in the passageway for controlling the flow of a fluid between the inlet and the outlet, the means including a valve assembly movable between a first open position spaced from a co-operating valve seat and a second closed position at which the valve assembly sealingly engages the valve seat, in which magnetic means is provided for biasing the valve assembly towards the second closed position.

In a preferred embodiment, at least a portion of the valve assembly is in the form of or incorporates a permanent magnet and a further magnet is located adjacent the valve seat. The further magnet may be a permanent magnet or alternatively an electro-magnet.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention will now be described, by way of example only, reference being made to the accompanying drawing which is a cross-section of a pressure relief valve according to the present invention.

Express Mail Label No. EF 132182188US

DETAILED DESCRIPTION OF THE INVENTION

As shown, a pressure relief valve 1 includes a housing 2 having an inlet 4 and spaced therefrom an outlet 6. Located in the passageway extending between the inlet 4 and the outlet 6 is means including a valve assembly 8 and a co-operating valve seat 10 for controlling the flow of a fluid, for example a gas between the inlet 4 and said outlet 6.

The valve assembly 8 depends from a valve cap 9 of magnetic material which is sealingly engaged in the upper (as shown) end of the housing 2. Surrounding that portion of the valve assembly 8 within the valve cap 9 is a polymer bush 7.

The valve stem assembly 8 includes a valve stem 12 from which extends radially outwardly therefrom a recessed flange 17. Resting on the upper surface of the recessed flange 17 and surrounding the valve stem 12 are a polymer shock absorber 11 and a magnetic stainless steel washer 13.

Attached to the lower (as shown) end of the recessed flange 17 by means of a fastener 18 is a spherical seal pad 15 and located within the recessed flange 17 above the spherical seal pad 15 is a permanent magnet 14 mounted against a mounting aid 5.

The valve seat 10 is made from magnetic material and adjacent the valve seat on that side of the valve seat opposite the spherical seal pad 15 is a magnet 16 also mounting against a mounting aid 5. The magnet 16 may be in the form of a permanent magnet or alternatively an electro-magnet.

Express Mail Label No. EF 132182188US

As shown, a magnetic stainless steel sleeve 3 depends from the valve cap 9 and surrounds the valve assembly 8.

The pressure relief valve 1 operates between two stable positions, namely fully shut and fully open. With the valve 1 in its fully shut position as shown, fluid is prevented from flowing through the passageway between the inlet 4 and the outlet 6 of the housing 2 since the spherical seal pad 15 sealingly engages the valve seat 10. The valve 1 will remain shut until the pressure differential between the inlet 4 and the outlet 6 increases to such an extent that an upward (as shown) force is produced on the spherical sealing pad 15 which overcomes both the attractive force between the magnet 16 and the magnet 14 and the weight of the valve assembly 8. If the upward force produced by the pressure differential equals or surpasses the magnetic force and the weight of the valve assembly 8 then the spherical seal pad 15 separates from the valve seat 10 to allow the passage of gas from the inlet 4 to the outlet 6.

The magnetic force between the spherical seal pad 15 and the valve seat 10 is adjusted to provide a force greater than the weight of valve assembly 8 such that when the pressure differential causes the spherical seal pad 15 to separate from the valve seat 10, thus cancelling the magnetic force, the valve assembly 8 is lifted clear. The gas flow between the flange 17 and the sleeve 3 produces an upward force greater than the weight of the valve assembly 8 propelling it towards the fully open position against the top cap 9.

With the valve 1 fully open there are three forces involved, namely the weight of the valve assembly 8, the force produced by the pressure differential across the recessed flange 17 and the magnetic force produced by the magnet 14 and the magnetic top cap 9. The magnetic force is adjusted to less than the weight of the

Express Mail Label No. EF 132182188US

valve assembly 8 by the relative positions of the magnet 14 and magnetic washer 13 to the valve top cap 9. This bridge could also be produced by incorporating an electro-magnet within or on the top cap 9.

When the force produced by the pressure differential between the flange 17 and the magnetic sleeve 3 is reduced the magnetic force cannot support the weight of the valve assembly 8 allowing it to lose contact with the top cap 9. The magnetic force between the valve assembly 8 and the top cap 9 becomes negligible as the valve assembly 8 falls downwards on the reduced gas glow until the closing magnetic force shuts the spherical seal pad 15 and the valve seat 10.

The pressure differential to initiate the opening by overcoming the magnetic force is greater than the pressure to move the valve assembly 8 to its fully open position. Similarly, the lower pressure differential required to initiate the closing by allowing the weight to overcome the magnetic force is lower than the pressure differential to keep the valve assembly 8 open and is not sufficient to support the weight of the valve assembly 8. This allows a free fall of the valve assembly 8 to the shut position.

The larger open and lesser closing pressure differentials are separated sufficiently to give a large hysteresis to prevent interactions between opening and closing as well as possible instability.

The shock absorber 11 provides a cushioning effect on the top surface of the valve stem assembly 8 to prevent or minimise valve flutter.

The polymer bush 7 protects the performance of the valve 1 in hostile environments by preventing deposition or corrosion on the sliding surfaces of the top cap 9 and the

Express Mail Label No. EF 132182188US

stem 12 of the valve assembly 8. The main function of the magnetic sleeve 3 is to provide outlet ports and to keep the valve within predetermined boundaries. The fact that it is made from magnetic material prevents any lateral instability by biasing the valve assembly 8 towards the nearest point of the sleeve 3.

The spherical seal pad 15 and the valve seat 10 geometry are arranged such that irrespective of the attitude or eccentricity of the valve assembly 8 in the magnetic sleeve 3 sealing is achieved by toppling onto the valve seat 10 without the necessity of laterally centralising by sliding.

The magnetic mounting aids 5 can be in the form of a wavy washer or polymer that absorbs any sudden shock or vibration thereby preventing damage to the permanent magnets 14, 16 which are usually brittle.

A particular advantage of the above described valve 1 is that the said valve opens at a predetermined pressure differential and remains open with a much lower pressure because once the valve assembly 8 has moved away from the valve seat 10 the magnetic force is reduced significantly. Furthermore, the combination of magnets, magnetic and non-magnetic materials along with the weight of the valve assembly 8 allows the user to tune easily the operating range. This is accomplished by selecting the relative position of the permanent magnets 14, 16 and their contact area which forms the actual sealing surface between the valve assembly 8 and the valve seat 10.

Express Mail Label No. EF 132182188US

WE CLAIM:

1. A valve comprising a housing having an inlet and space therefrom an outlet, a passageway extending between the inlet and the outlet, and means located in the passageway for controlling the flow of a fluid between the inlet and the outlet, the means including a valve assembly movable between a first open position spaced from a co-operating valve seat and a second closed position at which the valve assembly sealingly engages the valve seat, in which magnetic means is provided for biasing the valve stem assembly towards the second closed position.

2. The valve as claimed in Claim 1 in which at least a portion of the valve assembly is in the form of or incorporates a permanent magnet and a further magnet is located adjacent the valve seat.

3. The valve as claimed in Claim 2 in which the further magnet is a permanent magnet.

4. The valve as claimed in Claim 2 in which the further magnet is an electro-magnet.

5. The valve as claimed in Claim 1 in which the valve seat is made of magnetic material.

6. The valve as claimed in Claim 1 in which the valve assembly includes a spherical seal pad which sealingly engages the valve seat in the second closed position of the valve assembly.

7. The valve as claimed in Claim 1 in which the valve assembly depends from a valve cap made from magnetic material, which valve cap is sealingly attached to the housing.

8. The valve as claimed in Claim 7 in which an electro-magnet is uncorporated within or on the valve cap.

9. The valve as claimed in Claim 7 in which a magnetic sleeve depends from the valve cap and surrounds the valve assembly.

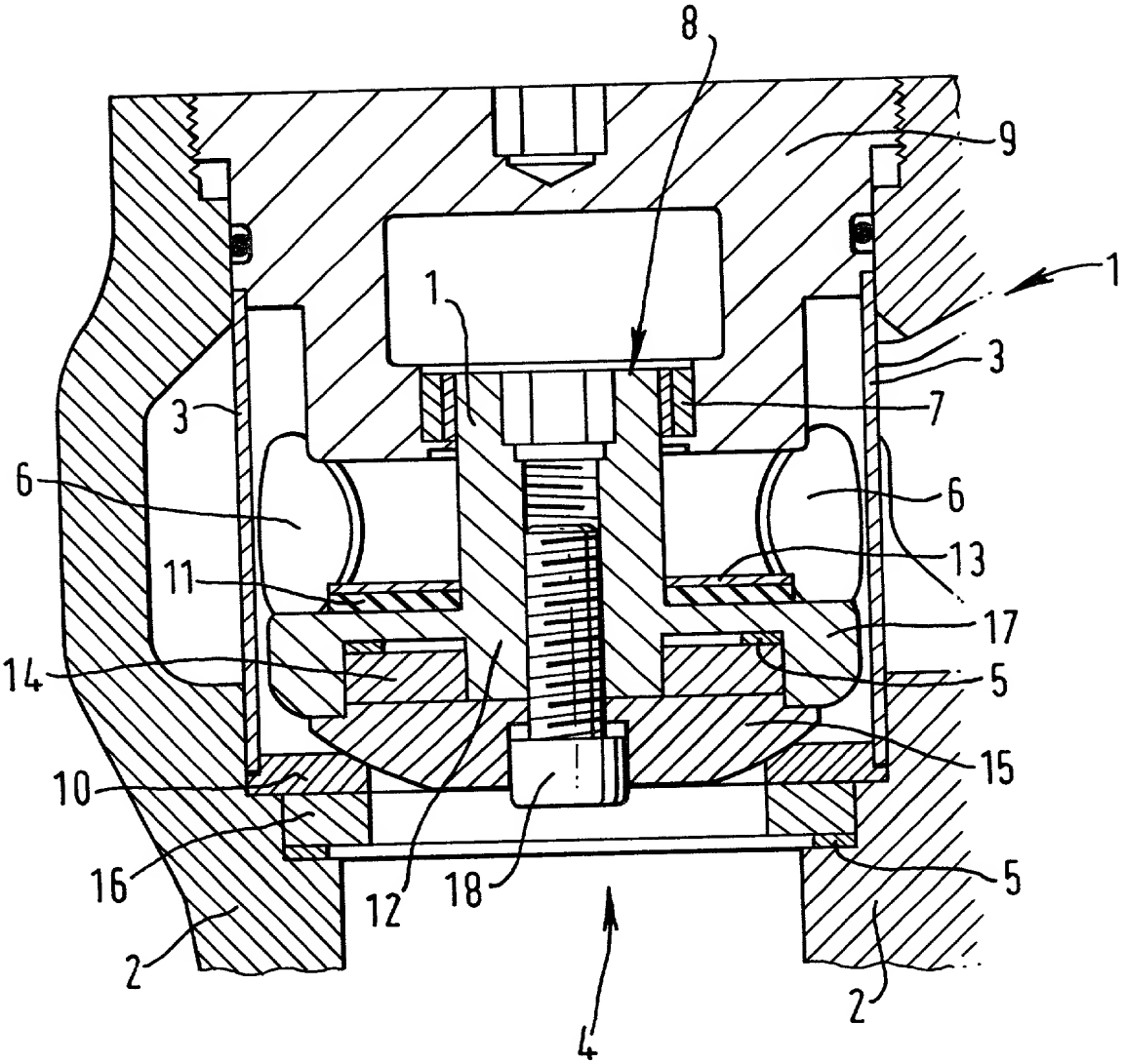
10. The valve as claimed in Claim 7 in which the valve assembly includes a shock absorber.

11. The valve as claimed in Claim 9 in which a polymer bush is provided which surrounds that portion of the valve assembly within the valve cap.

Express Mail Label No. EF 132182188US

ABSTRACT

A valve comprising a housing having an inlet and space therefrom an outlet, a passageway extending between the inlet and the outlet, and means located in the passageway for controlling the flow of a fluid between the inlet and the outlet, the means including a valve assembly movable between a first open position spaced from a co-operating valve seat and a second closed position at which the valve assembly sealingly engages the valve seat, in which magnetic means is provided for biasing the valve stem assembly towards the second closed position.


8
9
1
1
3
3
7
6
6
13
11
17
14
5
15
10
16
5
12
18
2
2
4